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Enzymatic production of fructose fatty acid ester using lipases from C. antarctica and porcine pancreatic

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Keywords: Lipase; Fructose ester; Biosurfactants; Esterification

Abstract

The aim of this work was to produce fructose fatty acid ester by enzymatic esterification of a fatty acid (oleic acid or linoleic acid) with fructose, using lipases (CALB) from *Candida antarctica* type B and porcine pancreas. The esterification reaction was conducted at 150 rpm and 40 °C during 72 hours. Equimolar (0.5 mmol) amounts of fructose and fatty acid were mixed with 0.6 ml of ethanol and sodium sulfate anhydrous (0.1 g) was added for the adsorption of the water generated during the reaction. In all experiments, 22.5 mg of lipase were used. A control experiment was performed using the same conditions except for the addition of lipase. Samples were analyzed by thin layer chromatography (TLC), using silica gel plates. The plates were placed in an iodine chamber to develop fatty acid and sugar ester spots. According to the literature an Rf of 0.5 is expected for the fructose fatty acid ester using chloroform/ hexane (1:1, v/ v) as eluting solvent. Four different reaction schemes were studied in this work namely, sample 1 (oleic acid, fructose, *C. antarctica* lipase, sodium sulfate and ethanol), sample 2 (oleic acid, fructose, porcine pancreatic lipase, sodium sulfate and ethanol), sample 3 (linoleic acid, fructose, *C. antarctica* lipase, sodium sulfate and ethanol) and sample 4 (linoleic acid, fructose, porcine pancreatic lipase, sodium sulfate and ethanol). From the TLC assays, the formation of fructose ester was observed for samples 1, 2 and 3. Additionally, the yield of esterification was determined by calculating the amount of residual fatty acid in the reaction mixture, which was determined using a volumetric method, as described elsewhere. Esterification yields of 74.3, 41.4, 63.5 and 11.2 % (v/ v) were determined for samples 1 to 4, respectively. Therefore, it was possible to conclude that the lipase obtained from *C. antarctica* had a better performance than the one obtained from porcine pancreas. Furthermore, the reaction schemes that used oleic acid conducted to higher yields of fructose ester production. These results point out that the enzymatic production of fructose esters is worthwhile and suggest the need for further research.